

PROCEEDINGS
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A NEW PUFFER FISH, *SPHOEROIDES PARVUS*, FROM
THE WESTERN GULF OF MEXICO, WITH A KEY TO
SPECIES OF *SPHOEROIDES* FROM THE ATLANTIC
AND GULF COASTS OF THE UNITED STATES

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Our taxonomic studies of the puffers (family Tetraodontidae) in the Atlantic Ocean and adjacent waters have revealed that the dominant inshore representative of the genus *Sphoeroides* Anonymous in the western Gulf of Mexico is an undescribed and endemic species. This discovery is especially relevant to the controversy concerning the relationship of the fish faunas of the eastern and western Gulf of Mexico. Baughman (1950: 118), Ginsburg (1952: 101), and Briggs (1958: 244) considered the faunas to be relatively distinct, and the latter author cited ecological evidence from Hedgpeth (1954: 206) to justify this view. Hildebrand (1954: 232) held the opposite opinion, and pointed to the apparent lack of evidence for endemic forms in the western Gulf of Mexico.

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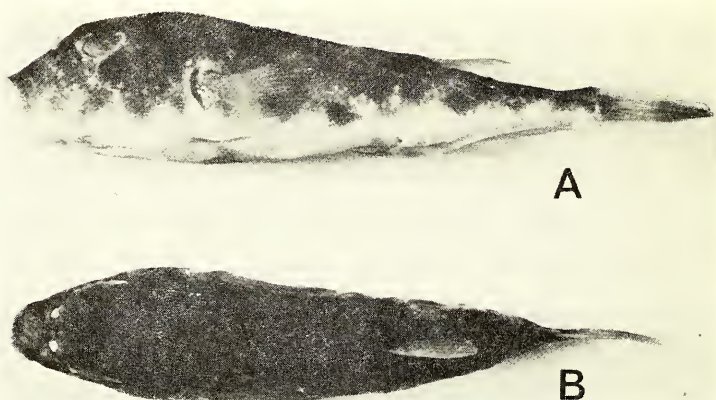


FIGURE 1. *Sphoeroides parvus* n. sp., A. holotype, 79.7 mm SL. Mobile Bay, Alabama, 8 August 1967. B. paratype, FSU 15365, from same series as holotype, 75.3 mm SL.

University of Corpus Christi, who supplied material from the Institute of Marine Science, University of Texas (IMS); and C. Richard Robins, University of Miami Marine Laboratory (UMML). Additional material was from the Florida State University (FSU) collection. Our especial thanks are extended to James R. Martin who aided in the collection of material, and to Dr. Victor G. Springer who reviewed the manuscript.

The terminology, counts, and measurements follow Hubbs and Lagler (1958: 19–26) except for the modifications discussed by Shipp and Yerger (1969: 425).

***Sphoeroides parvus* new species**

Least puffer

Fig. 1

Sphoeroides marmoratus. Gunter, 1945: 84.

Sphoeroides nephelus. Hildebrand, 1954: 320. Hildebrand, 1955: 218 (in part). Reid, 1955: 331. Hoese, 1958: 347. Miller, 1965: 103.

Sphaeroides nephelus. McFarland, 1963: 100. Parker, 1965: 218.

Holotype: USNM 203248, an adult female 79.7 mm standard length (SL), collected in a shrimp trawl near the center of Mobile Bay, Alabama, by R. L. Shipp and J. Martin, 8 August 1967.

Paratypes: Twenty-five series comprising 382 specimens from the northern and western Gulf of Mexico. FLORDIA: UMML 2618 (1

specimen, 62 mm SL), Apalachicola, 10 October 1950. UF 4437 (8, 54–69), Choctawhatchee Bay, East Pass, 11 December 1954. UF 2731 (2, 52–57), Pensacola, 3.5 mi. E of Inerarity Pt., 15 August 1953. BLBG (1, 53), lower Pensacola Bay, between ship channel and south shore from Big Lagoon to USCG station, 20 February 1964. ALABAMA: UA 62 (5, 47–64), Gulf Shores, 29 April 1950. FSU 15364 (35, 32–54), Mobile Bay, 8 August 1967. FSU 15365 (176, 21–90), taken with holotype. UA 296 (15, 48–86), Mississippi Sound, 15 November 1952. UA 397 (5, 46–97), Mississippi Sound, 5 December 1953. UA 1290 (17, 47–79), Mississippi Sound, 18 April 1964. MISSISSIPPI: UA 625 (22, 30–58), Mississippi Sound, 18 October 1957. LOUISIANA: TU 9381 (1, 51), Lake Pontchartrain, 2 mi. W of South Draw, 30°10'N, 89°55'W, 5 November 1954. TU 22573 (14, 41–67), Gulf of Mexico, off Grand Terre, 12 December 1959. ANSP 97647 (51, 42–75), Barataria Bay, 24 November 1931. TU 19038 (2, 80–90), Cameron, W bank Calcasieu River, 28 April 1957. TEXAS: BLGT Gus 1 E25 (1, 56), 29°10'N, 89°42'W, January 1963. BLGT Gus 4 W1 (3, 58–62), 29°01'N, 95°05'W, 2–7 March 1963. BLGT Gus 3 W13 (1, 62), 28°19'N, 96°21'W, 1–6 April 1963. ANSP 98279 (Oregon station 3829) (2, 54–56), 28°17.5'N, 93°57.5' W, 16 September 1962. BLGT Gus 1 W11 (2, 51–87), 27°42'N, 97°05'W, 2–5 February 1963. ANSP 98275 (2, 50–55), 26°18' N, 97°11'W, September 1962. IMS 624 (1, 118), Aransas Bay, July 1956. MEXICO: IMS 614 (3, 62–71), off Pta. Frontera, 29 July–6 August 1951. IMS 619 (8, 63–75), Campeche to Champoton, 10–16 February 1951. IMS 622 (4, 80–85), W of Campeche, 27–29 July 1951.

Ten paratypes from FSU 15365 (Alabama, see above) have been sent to each of the following institutions and assigned the indicated museum number: American Museum of Natural History, AMNH 27399; Field Natural History Museum, FNHM 74783; and Museum of Comparative Zoology, MCZ 46203.

Other specimens: ALABAMA: UA 286 (1, 104), Mobile Bay, 11 October 1952. MISSISSIPPI: GCRL V65: 1284 (1, 51), S of Horn Island, 28 August 1959. LOUISIANA: USNM 155990 (1, 70), Breton Island, 12 March 1931. GCRL V66: 311 (1, 51), S of Grand Isle, 23 October 1958. TEXAS: USNM 156492 (3, 63–86), Freeport, Texas, January–May, 1947. USNM 118648 (1, 88), Aransas Pass, 8 July 1941. USNM 155989 (1, 111), Aransas Pass, 4 April 1929. USNM 155992 (1, 111), Corpus Christi Bay, 11 November 1926. USNM 73580 (1, 64), Corpus Christi, 29 November 1891. ANSP 98263 (1, 71), Pt. Isabel, 30 November 1947.

Diagnosis: One of the smallest puffers (rarely exceeds 100 mm SL), distinguished from other members of the genus by a combination of characters: absence of lappets on dorsal surface of body, absence of deeply pigmented spot in pectoral fin axil, snout short, interorbital region broad, flat (least bony interorbital width 25% or more of snout length), and integument heavily covered by prickles, which do not extend posteriorly beyond level of anus.

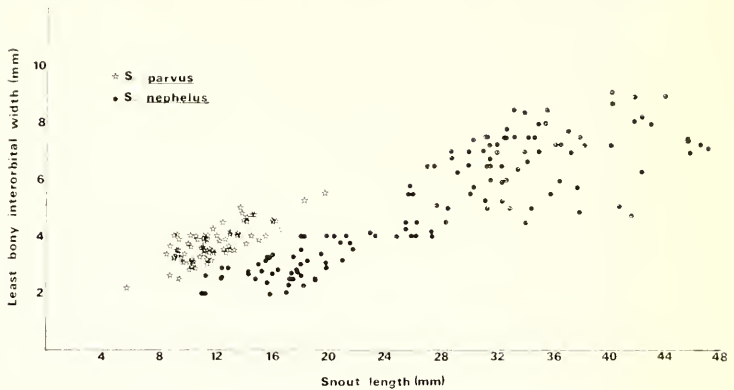


FIGURE 2. Relationship between least bony interorbital width and snout length in *Sphoeroides nephelus* and *S. parvus*. (Data on *S. nephelus* from Shipp and Yerger, 1969).

Superficially, *Sphoeroides parvus* most closely resembles *S. nephelus* (Goode and Bean) and *S. maculatus* (Bloch and Schneider). It differs from both species by the lack of a deeply pigmented spot at the axil of the pectoral fin. It further differs from *S. nephelus* in having a broad flat interorbital region, a shorter snout [interorbital width less than one-fourth snout length (Fig. 2)], and an irregular placement of the ventral-most lateral spots (in *S. nephelus* these are arranged in an even row along the ventrolateral body angle, see Fig. 3). It differs from *S. maculatus* (Fig. 5D) in having the shape of the ventrolateral markings chiefly round rather than vertically elongate, the prickles on the ventral surface not extending beyond the anus, and by the absence of tiny jet-black specks over most of the pigmented body surface.

Description: Body size small, snout short (18 percent SL), interorbital region flat to slightly concave, very broad (5 percent SL). Anterior body surface covered with close-set prickles or dermal spines, exposed in both uninflated and inflated specimens; dorsally, prickles extend posteriorly to dorsal fin origin, and ventrally almost to anus.

Morphometric data for the holotype and 20 paratypes are given in Table I.

Fin ray counts of 50 type specimens chosen at random from throughout the range of the species are as follows (the value including the holotype is italicized): dorsal rays 8 (in 43 specimens), 9 (7); anal rays 6 (4), 7 (45), 8 (1); pectoral rays (both sides counted separately) 13 (1), 14 (33), 15 (62), 16 (4).

Coloration: Ground color on dorsal surface brown or grey with scattered, indistinct blotches or spots; laterally ground color fades slightly above ventrolateral body angle; lower sides and ventral surface unpig-



FIGURE 3. A. *Sphoeroides nephelus*, FSU 15606, 182 mm SL, Key Largo, Monroe Co., Florida, 29 December 1967. B. *S. parvus*, paratype, FSU 15365, 75.3 mm SL, Mobile Bay, Alabama, 8 August 1967. Note interspecific differences: size of adults, arrangement of lateral spots, and snout length.

TABLE 1. Measurements of the holotype and 20 paratypes of *Sphoeroides parvus* expressed in percent of standard length.

	Holotype	Paratypes*	
		Range	Mean
Standard length	79.7	56-97	72.1
Head length	36.1	33.4-38.5	35.7
Snout length	17.9	16.6-19.4	17.8
Least bony interorbital width	5.5	4.4-6.3	5.1
Pectoral fin length	15.9	15.5-21.2	17.8
Depressed dorsal fin length	17.9	16.0-20.1	18.3
Depressed anal fin length	13.7	12.7-18.2	15.4
Caudal fin length	20.2	18.7-23.4	20.9
Snout to dorsal origin	71.4	66.0-74.8	70.5

*FSU 15365 (4 specimens); UA 397 (4); ANSP 97647 (2); TU 19038 (2), 22573 (1); BLGT: Gus 1 E25 (1), Gus 1 W4 (3), Gus 1 W11 (2), Gus 3 W13 (1).

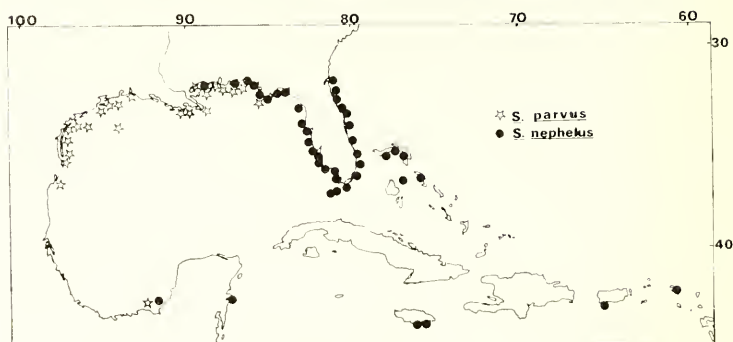


FIGURE 4. General distribution of two species of *Sphoeroides* based on specimens examined. Distribution of *S. nephelus* is included (based on Shipp and Yerger, 1969) to indicate distributional patterns and zone of sympatry with *S. parvus*.

mented. Lateral blotches or spots slightly more distinct than those on dorsum; not always arranged in an even row, but tend to border ventral boundary of ground color. Spot present in pectoral fin axil in few specimens, but rarely more intensely pigmented than others on body. Indistinct dark bar present between eyes. Dorsal and lateral surfaces often with vague white specks, which may appear bright green in live specimens. A few black specks on cheeks in some larger specimens. No other noteworthy color marks appear in live specimens except for yellow or gold cast over much of lateral and ventral surfaces. All fins unpigmented except caudal, which may have an indistinct pigmented area near its base and another near its distal end.

Adult size: *S. parvus* is the smallest known species of *Sphoeroides* in the Atlantic Ocean and adjacent waters; the largest specimen examined was 118 mm SL. Several authors previously noted the small size of this puffer in the western Gulf (Gunter, 1945: 84; Hildebrand, 1954: 320; Reid, 1955: 449; Miller, 1965: 103). Hildebrand (1955: 218) reported a 91 mm (total length) female with nearly ripe ovaries. We have examined females as small as 55 mm SL and males 47 mm SL which were sexually mature. The closely related species on the Gulf and Atlantic coasts do not mature until a much larger size is attained (about 70 mm SL in *S. maculatus*, usually more than 100 mm SL in *S. nephelus*), and commonly exceed 150 mm SL (Fig. 3).

Distribution: *S. parvus* occurs from Apalachicola Bay, Florida, westward throughout the western Gulf of Mexico. *S. nephelus* is the dominant form in the clear waters of northwest Florida to Pensacola, but *S. parvus* replaces it in the muddy waters of Mobile Bay and westward (Fig. 4). The senior author has examined many hundreds of puffers captured by shrimp boats in Mobile Bay, and not one *S. nephelus* was found. This is

further verified by personal communication with the shrimpers who trawl both the clear and muddy localities. Specimens of *S. uephelus* west of Florida are rare. In the southwestern Gulf of Mexico, Hildebrand (1955: 218) reported both forms from the Campeche shrimp grounds, but *S. parvus* was much more abundant.

Zoogeography: *Sphoeroides parvus*, *S. maculatus*, and *S. uephelus* constitute a closely related species complex. *Sphoeroides parvus*, found in the northern and western Gulf, is more closely allied morphologically to *S. maculatus*, which occurs in the Atlantic from Canada to northeastern Florida (Shipp and Yerger, 1969: 426), than to *S. uephelus*, a predominantly West Indian species which occurs on both coasts of Florida. We believe that prior to the existence of the Florida peninsula, a continuous population of puffers (the progenitor of *S. maculatus* and *S. parvus*) was found around the southern coast of the United States. The emergence of this peninsula split the population into two, one isolated in the Atlantic, the other in the Gulf. Simultaneously the projection of this peninsula into the tropical waters of the Caribbean provided suitable habitat for the northward dispersal of *S. uephelus* from West Indian stocks. One or both of these factors, a land barrier and competition with a closely related species, apparently has maintained the isolation between the two original coastal populations, and speciation has ensued. Meanwhile *S. uephelus* is probably prevented from further dispersal northward and westward by ecological barriers. The distribution of *S. uephelus* and *S. parvus* in the Gulf of Mexico closely matches the ecologically distinct habitats described by Hedgpeth (1954: 206).

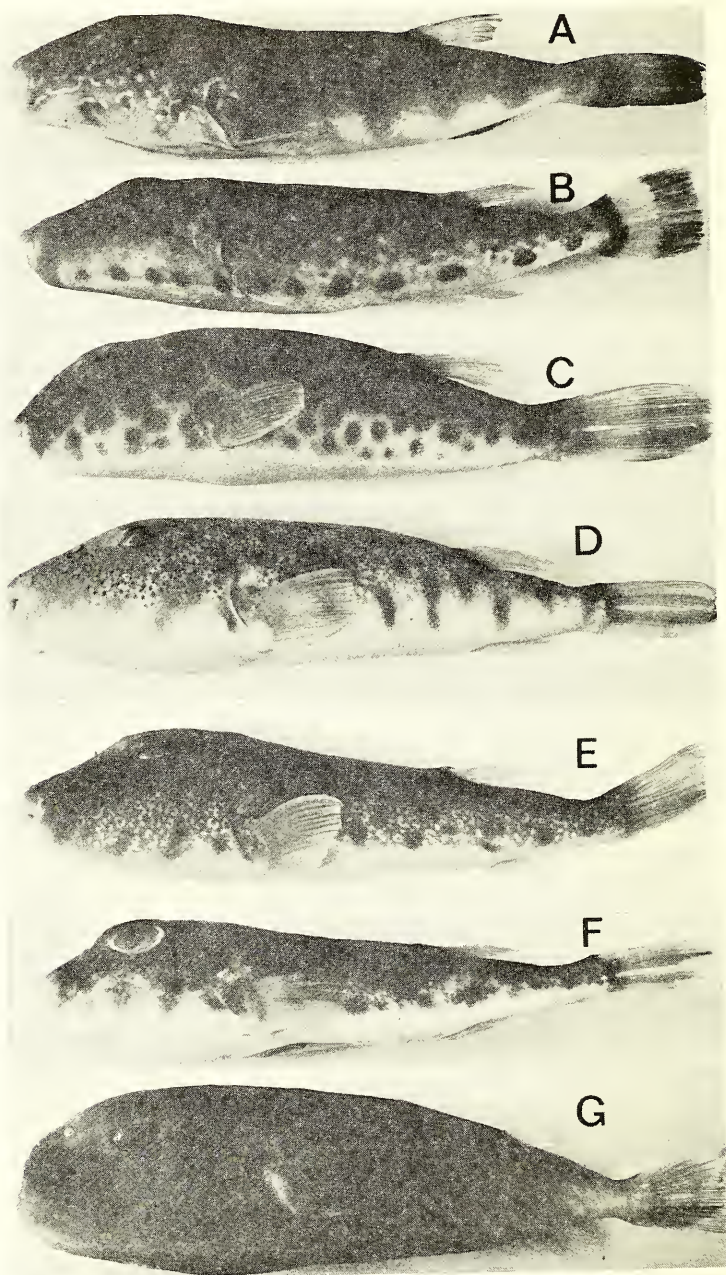
This hypothesis supports that proposed by Springer (1959) for an explanation of the strikingly similar distribution of the blennioid fishes, *Chasmodes bosquianus* and *C. saburrae*, although the geologic dates which he suggested for various shorelines may be erroneous.

Among other species of fishes with distributional patterns similar to *S. parvus* in the northern and western Gulf are the sole, *Gymnachirus texae* (see Dawson, 1964), the sparid, *Stenotomus caprinus* (see Caldwell, 1955), and the cyprinodont, *Fundulus confluentus pulvereus* (see Relyea, 1965).

KEY TO SPECIES OF *SPHOEROIDES* ON THE ATLANTIC AND GULF COASTS OF THE UNITED STATES

Although the status of the puffers in the Southern and Eastern Atlantic Ocean and parts of the Caribbean has not yet been studied satisfactorily, the species which occur on the shores of the United States (Atlantic and Gulf of Mexico) are now sufficiently well known to provide a key to facilitate their identification.

- 1A. Lappets (small fleshy tabs) present on dorsum; either a single, black pair on the dorsum about one-half the distance between the posterior margins of the orbits and the dorsal fin origin, or many tan lappets (most easily seen when specimens are im-



- mersed in water) scattered on the posteriolateral and dorsolateral surfaces 2
- 1B. Lappets absent 3
- 2A. A single pair of black lappets present on the dorsum. Cheeks often marbled. From one to five poorly defined dark blotches present on the lateral body surface posterior to the pectoral fin *S. dorsalis* Longley, Marbled puffer. Widespread in western Atlantic and adjacent waters, in relatively deep water (10–50 fathoms). Fig. 5A.
- 2B. Many tan lappets present on the posterior portions of the body, usually concentrated near the ventrolateral body angle. No marbled pattern on cheeks. Five to eight (usually six or seven) sharply defined, rounded lateral spots posterior to the pectoral fin bordering the ventrolateral body angle *S. spengleri* (Bloch), Bandtail puffer. Widespread in the western Atlantic and adjacent waters, in shallow water. Fig. 5B.
- 3A. Body variously mottled, not uniformly pigmented. Caudal dusky, sometimes with pigment concentrated at base and distal end, giving an indistinct barred appearance. Least bony interorbital width 8.5 percent or less of SL 4
- 3B. Body uniformly pigmented, except usually a few scattered spots on dorsal and lateral surfaces. Caudal dusky except for distal tips which are usually lighter. Least bony interorbital width 9 percent or more of SL 7
- 4A. One or two distinct, white, interorbital bars, the posterior often connected by a posterior perpendicular extension to a dorsal pattern of coarse white arches and circular markings *S. testudineus* (Linnaeus), Checkered puffer. Widespread in Caribbean, southern Gulf of Mexico, and warmer waters of the western Atlantic, in shallow water. Fig. 5C.
- 4B. One vague, dark interorbital bar. No dorsal pattern of coarse white arches 5
- 5A. Several (usually six-eight) distinct, vertically elongate bars posterior to pectoral fins. Dorsal and lateral surfaces in mature speci-

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FIGURE 5. A. *Sphoeroides dorsalis*, ANSP 105185, 127 mm SL, Tobago. B. *Sphoeroides spengleri*, ANSP 104555, 111 mm SL, Columbia. C. *Sphoeroides testudineus*, FSU 11928, 86 mm SL, Jupiter Inlet, Florida. D. *Sphoeroides maculatus*, UF 11773, 171 mm SL, Georgia. E. *Sphoeroides nephelus*, UMMML 1366, 197 mm SL, Cocoa, Florida. F. *Sphoeroides parvus* FSU 15365, 84 mm SL, Mobile Bay, Alabama. G. *Sphoeroides pachygaster*, BLBG, Silver Bay 2190, 132 mm SL, Atlantic Ocean, off South Carolina.

mens (above 70 mm) covered with tiny (1–2 mm) jet-black spots. Prickles on ventral surface extend posteriorly beyond the anus, usually to the anal fin origin. Pectoral rays 15–17, usually 16

----- *S. maculatus* (Bloch and Schneider), Northern puffer.
Western North Atlantic, from Newfoundland to
northeast Florida, usually in shallow water. Fig. 5D.

- 5B. Spots present posterior to pectoral fins. No tiny jet-black spots on dorsal or lateral surfaces. Prickles present or absent, but when present, do not extend beyond the anus. Pectoral rays usually 14 or 15 (rarely 13 or 16) ----- 6

- 6A. Spot at axil of pectoral fin more intense than any other on body. Bony interorbit usually concave; least bony width narrow, more than 4 in snout. Adults commonly exceed 125 mm SL -----

----- *S. nephelus* (Goode and Bean), Southern puffer.
Caribbean, eastern Gulf of Mexico, and Atlantic coast
of Florida, in shallow water. Fig. 5E.

- 6B. Spot at axil of pectoral fin absent, or if present, rarely more intense than other spots on body. Bony interorbit nearly flat; least bony width broad, less than 4 in snout. Not known to reach 120 mm SL -----

----- *S. parvus* Shipp and Yerger, Least puffer. Northern
and western Gulf of Mexico, in shallow water. Fig. 5F.

- 7A. Body smooth. Caudal short, more than 6 in SL -----

----- *S. pachygaster* (Müller and Troschel), Blunthead puffer. Most of western Atlantic, in relatively deep water (30–100 fathoms). Fig. 5G.

- 7B. Prickles on dorsal and ventral surface. Caudal moderately long, about 5 in SL -----

----- *S. trichocephalus* (Cope), Hairy puffer. Known from
one specimen washed ashore at Rhode Island. Not figured.

LITERATURE CITED

- BAUGHMAN, J. L. 1950. Random notes on Texas fishes. Part I. Texas Jour. Sci. 1: 117–138.
- BRIGGS, J. C. 1958. A list of Florida fishes and their distribution. Bull. Fla. State Mus. (Biol. Sci.) 2(8): 223–318.
- CALDWELL, D. K. 1955. Distribution of the longspined porgy, *Stenotomus caprinus*. Bull. Mar. Sci. Gulf and Carib. 5(2): 230–239.
- DAWSON, C. E. 1964. A revision of the western Atlantic flatfish genus *Gymnachirus* (the naked soles). Copeia 1964 (4): 646–665.
- GINSBURG, I. 1952. Eight new fishes from the Gulf coast of United States, with two new genera, and notes on geographic distribution. Jour. Wash. Acad. Sci. 42(3): 84–101.
- GUNTER, G. 1945. Studies on marine fishes of Texas. Publ. Inst. Mar. Sci. Univ. of Texas 1(1): 1–190.

- HEDGPETH, J. W. 1954. Bottom communities of the Gulf of Mexico. In: P. S. Galtsoff (coordinator), Gulf of Mexico, its origin, water, and marine life. Fish. Bull. U. S. Fish and Wildl. Ser. 55 (89): 203-214.
- HILDEBRAND, H. H. 1954. A study of the fauna of the brown shrimp (*Penaeus aztecus* Ives) grounds in the western Gulf of Mexico. Publ. Inst. Mar. Sci. Univ. of Texas 3(2): 234-366.
- . 1955. A study of the fauna of the pink shrimp grounds in the Gulf of Campeche. Publ. Inst. Mar. Sci. Univ. of Texas 4(1): 169-232.
- HOESE, H. D. 1958. A partially annotated checklist of the marine fishes of Texas. Publ. Inst. Mar. Sci. Univ. of Texas 5: 312-352.
- HUBBS, C. L. AND K. L. LAGLER. 1958. Fishes of the Great Lakes region (revised edition). Bull. Cranbrook Inst. Sci. 26: 1-186.
- McFARLAND, W. N. 1963. Seasonal changes in the number and biomass of fishes from the surf at Mustang Island, Texas. Publ. Inst. Mar. Sci. Univ. of Texas 9: 91-105.
- MILLER, J. M. 1965. A trawl survey of the shallow gulf fishes near Port Aransas, Texas. Publ. Inst. Mar. Sci. Univ. of Texas 10: 80-107.
- PARKER, J. C. 1965. An annotated checklist of the fishes of the Galveston Bay system, Texas. Publ. Inst. Mar. Sci. Univ. of Texas 10: 201-220.
- REID, G. K. 1955. A summer study of the biology and ecology of East Bay, Texas. Part II. Texas Jour. Sci. 7(4): 430-453.
- RELYEA, K. G. 1965. Taxonomic studies of the cyprinodont fishes, *Fundulus confluentus* Goode and Bean, and *Fundulus pulvereus* (Evermann). M. S. thesis, Florida State Univ., Tallahassee, Fla.
- SHIPP, R. L. AND R. W. YERGER. (1969). Status, characters, and distribution of the northern and southern puffers of the genus *Sphoeroides*. Copeia 1969 3: 425-433.
- SPRINGER, V. G. 1959. Blennioid fishes of the genus *Chasmodes*. Texas Jour. Sci. 11: 321-334.

